

# ***Snipes-Dye associates***

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**CEQA PRELIMINARY**  
**HYDROLOGY/DRAINAGE STUDY**  
**HONEY HILL RANCH ROAD/TOBY TM**

County of San Diego

**TM 5437; LOG NO. 05-14-025**

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Dated: May 13, 2005

Prepared By:

***Snipes-Dye Associates***  
***civil engineers and land surveyors***

8348 Center Drive, Suite G  
La Mesa, CA 91942-2910  
619/697-9234, fax 619/460-2033

AL1171

**SDC DPLU RCVD 5-25-06**

**TM5437**

# ***Snipes-Dye associates***

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## **CEQA PRELIMINARY HYDROLOGY/DRAINAGE STUDY HONEY HILL RANCH ROAD/TOBY TM**

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Dated: May 13, 2005

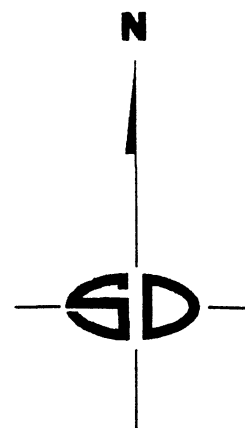
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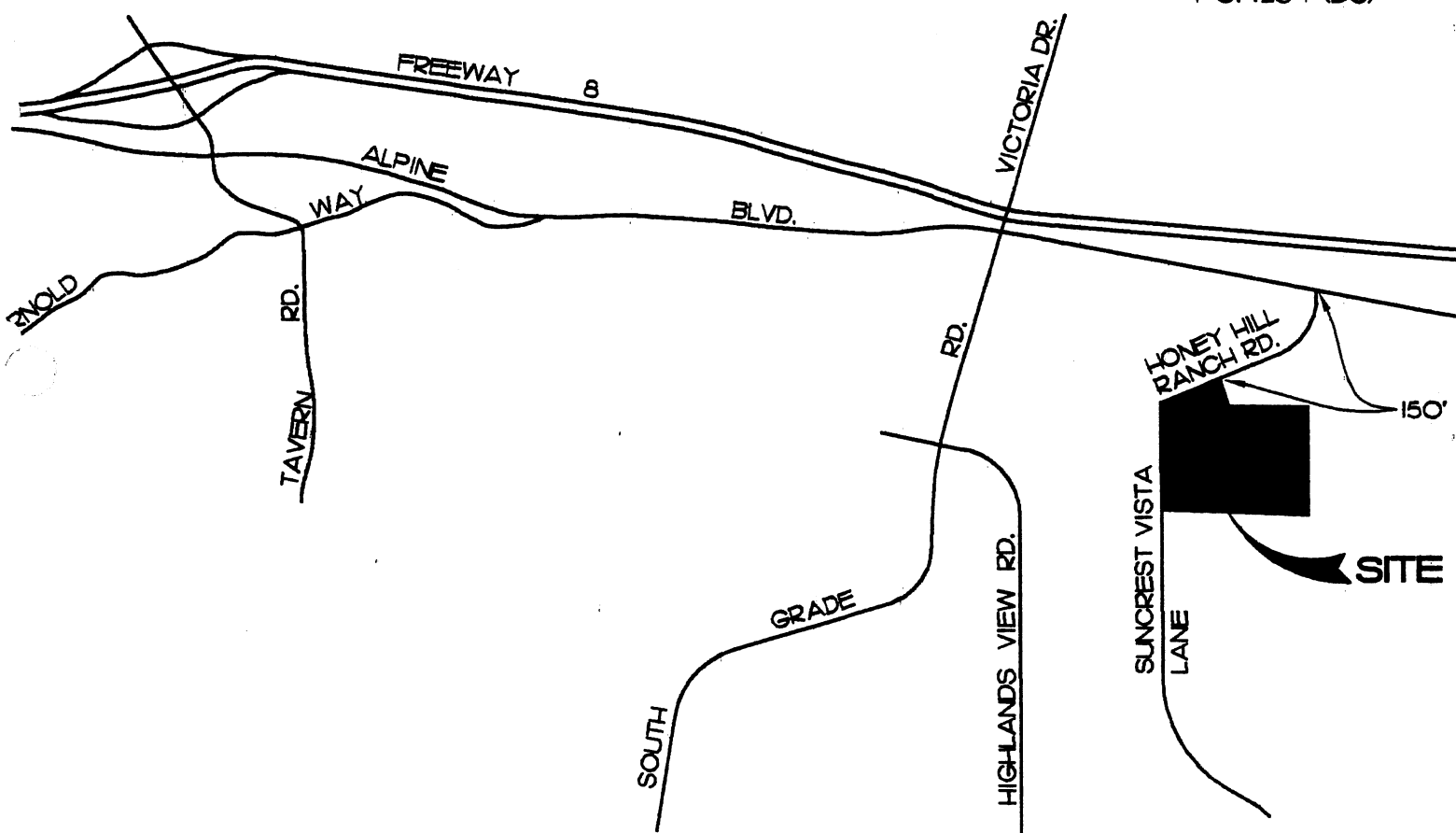
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THOMAS BROS.  
PG. 1234 (D6)



# VICINITY MAP

NO SCALE

## **Preliminary Hydrology and Hydraulic Calculations for the Honey Hill Ranch Road/Toby Subdivision**

The project proposes the development of a standard residential subdivision on 4.20 acres of previously disturbed property. The site is located at the southeasterly corner of Honey Hill Ranch Road and Suncrest Vista Lane in the unincorporated area of Alpine. The site currently has one single family residence, a guesthouse, a singlewide mobile home, two riding arenas and a horse barn and stalls. The entire site has been disturbed. Current site vegetation consists of non-native grasses and weeds. Site topography consists of fairly gently sloping with the existing residence being located at the top of the knoll. The land slopes in all directions, away from the existing residence.

Rational method peak discharge calculations have been prepared for the site including the small offsite basin. A point of discharge was chosen to provide a common point to compare pre- and post-development flows at three locations. The project's drainage basins consist of a westerly, northerly and southerly drainage basin. Calculated 100-year, six-hour peak discharge for the current (pre-development) condition is approximately 8.71 cubic feet per second for the westerly basin, 2.56 cubic feet per second for the northerly basin and 5.42 cubic feet per second for the southerly basin. The total pre-development discharge was calculated to be 16.69 cubic feet per second.

Project development proposes the construction of a private cul-de-sac street off of Suncrest Vista Lane with seven residential lots abutting the private road. The minimum proposed lot is 0.50 acre net in size. Multiple medium sized cut and fill slopes (less than 15 feet high) are necessary and are located along the proposed lot boundary lines to allow for grading of the project. Rational method 100-year, six-hour peak discharge calculations for the developed site indicate a peak discharge at the three common points of approximately 9.56 cubic feet per second for the westerly basin, 2.19 cubic feet per second for the northerly basin and 3.33 cubic feet per second for the southerly basin. The total post-development discharge was calculated to be 15.08 cubic feet per second

Development of the site will increase the peak discharge at the common point in the 100-year, six-hour storm event approximately 0.85 cubic feet per second for the westerly basin and will decrease the peak discharge approximately 0.37 cubic feet per second for the northerly basin and approximately 2.09 cubic feet per second for the southerly basin. The net decrease in runoff of 1.61 cubic feet per second for all three basins combined in the developed condition is considered insignificant.

The westerly basin will discharge at the intersection of Suncrest Vista Lane and Honey Hill Ranch Road. As the property currently stands the discharge will be to vacant property, but the adjoining property is slated for a commercial center with a grocery store as the anchor. A knuckle will be constructed at the subject

intersection with a curb inlet proposed to collect the street runoff. The northerly basin currently and will continue to discharge in a sheet flow fashion to the commercial property to the north. The southerly basin will discharge to the residential subdivision to the south and the vacant property to the east as is in the pre-development phase.

None of the proposed homesites on the seven lots would be subject to flooding in the 100-year storm. The subject site is not located within any 100-year flood hazard areas.

Hydrology and flow calculations were prepared utilizing AES Hydrology software and the current San Diego County Hydrology Manual.

# County of San Diego Hydrology Manual



## Rainfall Isopleths

100 Year Rainfall Event - 6 Hours

..... Isopleth (inches)

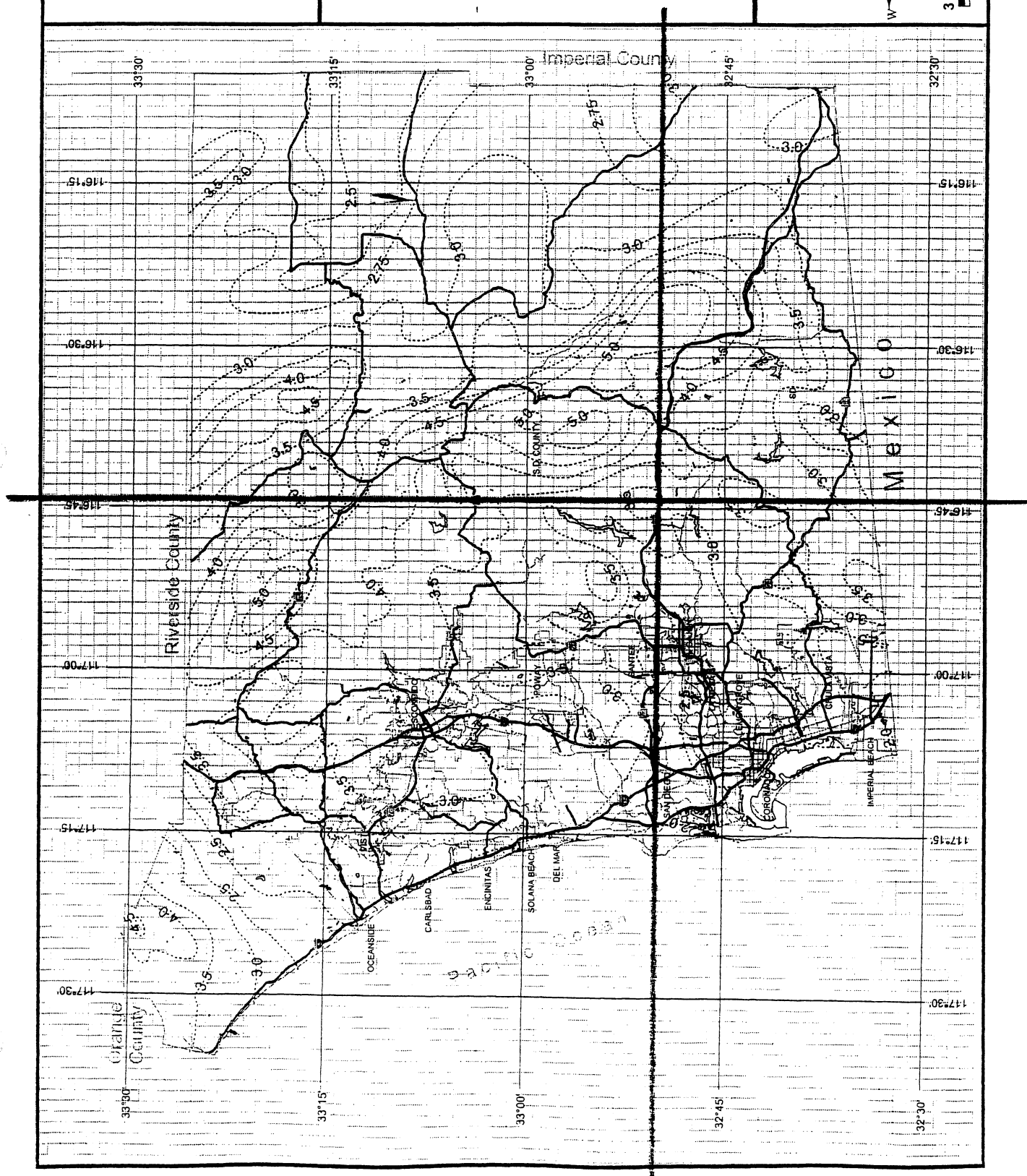
$$P_{6100} = 3.5$$



3 0 3 Miles



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# County of San Diego Hydrology Manual



## Rainfall Isopleths

100 Year Rainfall Event - 24 Hours

Isopleth (inches)

$P_{24,100} = 7.6$

PLANNING  
GIS

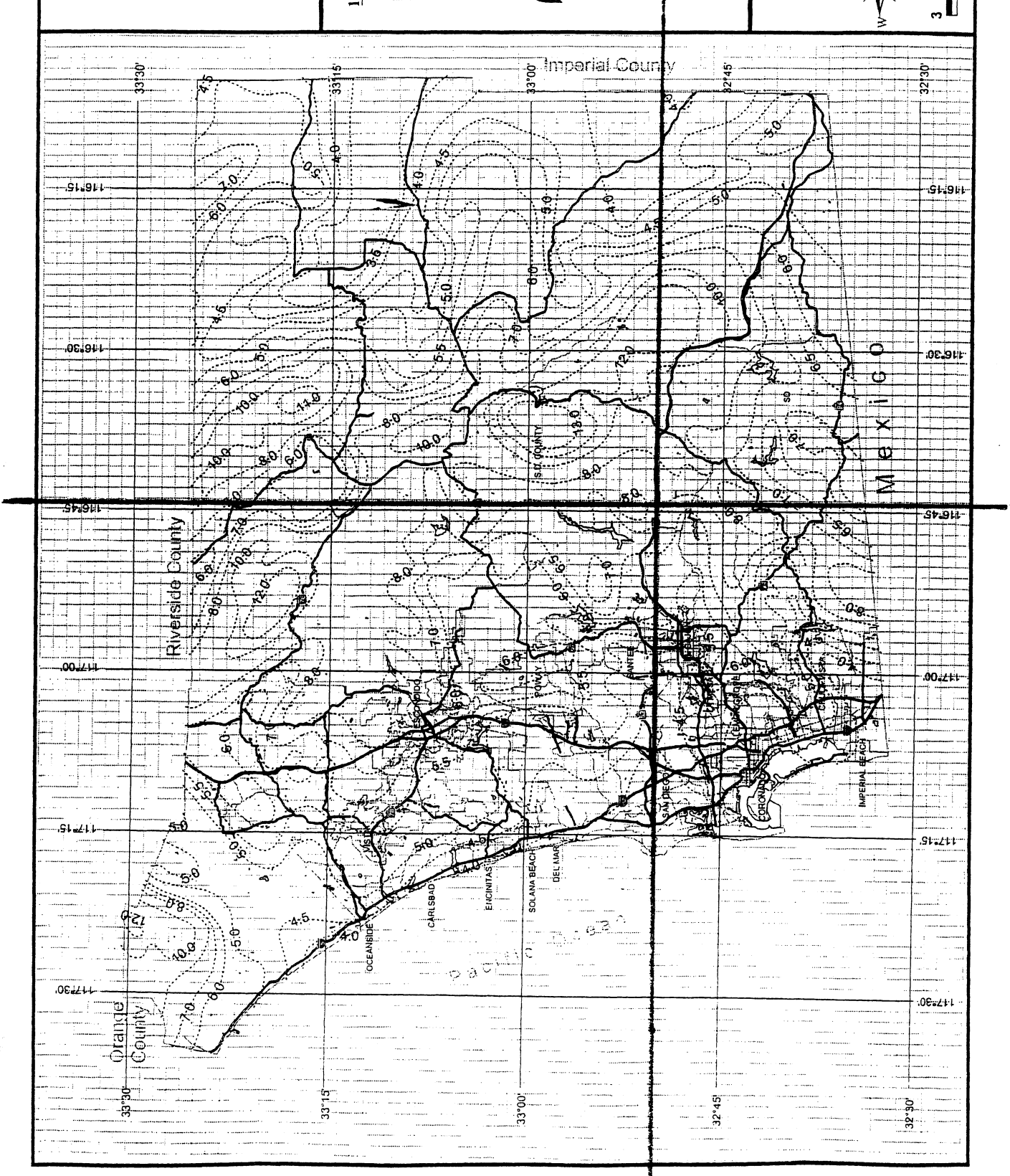
GIS  
County of San Diego

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3 0 3 Miles



**Table 3-1  
RUNOFF COEFFICIENTS FOR URBAN AREAS**

Land Use		Runoff Coefficient "C"					
NRCS Elements	County Elements	% IMPER.	Soil Type				
			A	B	C	D	
Undisturbed Natural Terrain (Natural)	Permanent Open Space	0*	0.20	0.25	0.30	0.35	
Low Density Residential (LDR)	Residential, 1.0 DU/A or less	10	0.27	0.32	0.36	0.41	
Low Density Residential (LDR)	Residential, 2.0 DU/A or less	20	0.34	0.38	0.42	0.46	
Low Density Residential (LDR)	Residential, 2.9 DU/A or less	25	0.38	0.41	0.45	0.49	
Medium Density Residential (MDR)	Residential, 4.3 DU/A or less	30	0.41	0.45	0.48	0.52	
Medium Density Residential (MDR)	Residential, 7.3 DU/A or less	40	0.48	0.51	0.54	0.57	
Medium Density Residential (MDR)	Residential, 10.9 DU/A or less	45	0.52	0.54	0.57	0.60	
Medium Density Residential (MDR)	Residential, 14.5 DU/A or less	50	0.55	0.58	0.60	0.63	
High Density Residential (HDR)	Residential, 24.0 DU/A or less	65	0.66	0.67	0.69	0.71	
High Density Residential (HDR)	Residential, 43.0 DU/A or less	80	0.76	0.77	0.78	0.79	
Commercial/Industrial (N. Com)	Neighborhood Commercial	80	0.76	0.77	0.78	0.79	
Commercial/Industrial (G. Com)	General Commercial	85	0.80	0.80	0.81	0.82	
Commercial/Industrial (O.P. Com)	Office Professional/Commercial	90	0.83	0.84	0.84	0.85	
Commercial/Industrial (Limited I.)	Limited Industrial	90	0.83	0.84	0.84	0.85	
Commercial/Industrial (General I.)	General Industrial	95	0.87	0.87	0.87	0.87	

\*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).

DU/A = dwelling units per acre

NRCS = National Resources Conservation Service

PRE  
POST



# **PRE-DEVELOPMENT**

\*\*\*\*\*

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT  
2003,1985,1981 HYDROLOGY MANUAL  
(c) Copyright 1982-2004 Advanced Engineering Software (aes)  
Ver. 2.0 Release Date: 01/01/2004 License ID 1305

Analysis prepared by:

Snipes-Dye Associates  
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La Mesa, CA 91942-2910  
Fax (619)460-2033 Phone (619)697-9234

\*\*\*\*\* DESCRIPTION OF STUDY \*\*\*\*\*  
\* HONEY HILL RANCH ROAD/TOBY TENTATIVE MAP \*  
\* **PRE-DEVELOPMENT RUNOFF CALCULATIONS** \*  
\* \*  
\*\*\*\*\*

FILE NAME: AL1171PR.DAT  
TIME/DATE OF STUDY: 16:24 05/12/2005

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:  
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2003 SAN DIEGO MANUAL CRITERIA

**USER SPECIFIED STORM EVENT(YEAR) = 100.00**

6-HOUR DURATION PRECIPITATION (INCHES) = 3.500  
SPECIFIED MINIMUM PIPE SIZE(INCH) = 4.00  
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95  
SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD

NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS

\*USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL\*

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT- / PARK- SIDE / SIDE / WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH (FT)	LIP (FT)	HIKE (FT)	MAN- NING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0313	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET  
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)\*(Velocity) Constraint = 6.0 (FT\*FT/S)

\*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN  
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.\*

## BASIN A - WESTERLY BASIN

\*\*\*\*\*

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

-----  
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<  
=====

RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600

SOIL CLASSIFICATION IS "D"

S.C.S. CURVE NUMBER (AMC II) = 84

INITIAL SUBAREA FLOW-LENGTH(FEET) = 480.00

UPSTREAM ELEVATION(FEET) = 2086.00

DOWNSTREAM ELEVATION(FEET) = 2057.00

ELEVATION DIFFERENCE(FEET) = 29.00

SUBAREA OVERLAND TIME OF FLOW(MIN.) = 6.325

WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN

THE MAXIMUM OVERLAND FLOW LENGTH = 100.00

(Reference: Table 3-1B of Hydrology Manual)

THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN  $T_c$  CALCULATION!

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.924

SUBAREA RUNOFF(CFS) = 8.71

TOTAL AREA(ACRES) = 2.39      **TOTAL RUNOFF(CFS) = 8.71**

## BASIN B - NORTHERLY BASIN

\*\*\*\*\*

FLOW PROCESS FROM NODE 10.00 TO NODE 11.00 IS CODE = 21

-----  
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

=====

RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600

SOIL CLASSIFICATION IS "D"

S.C.S. CURVE NUMBER (AMC II) = 84

INITIAL SUBAREA FLOW-LENGTH(FEET) = 90.00

UPSTREAM ELEVATION(FEET) = 2088.20

DOWNSTREAM ELEVATION(FEET) = 2072.00

ELEVATION DIFFERENCE(FEET) = 16.20

SUBAREA OVERLAND TIME OF FLOW(MIN.) = 5.073

WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 9.136

SUBAREA RUNOFF(CFS) = 2.56

TOTAL AREA(ACRES) = 0.61    **TOTAL RUNOFF(CFS) = 2.56**

## BASIN C - SOUTHERLY BASIN

\*\*\*\*\*

FLOW PROCESS FROM NODE 20.00 TO NODE 21.00 IS CODE = 21

-----  
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

=====

RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600

SOIL CLASSIFICATION IS "D"

S.C.S. CURVE NUMBER (AMC II) = 84

INITIAL SUBAREA FLOW-LENGTH(FEET) = 210.00

UPSTREAM ELEVATION(FEET) = 2086.00

DOWNSTREAM ELEVATION(FEET) = 2075.50

ELEVATION DIFFERENCE(FEET) = 10.50

SUBAREA OVERLAND TIME OF FLOW(MIN.) = 6.737

WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN

THE MAXIMUM OVERLAND FLOW LENGTH = 100.00

(Reference: Table 3-1B of Hydrology Manual)

THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN T<sub>c</sub> CALCULATION!

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.608

SUBAREA RUNOFF(CFS) = 5.42

TOTAL AREA(ACRES) = 1.55      **TOTAL RUNOFF(CFS) = 5.42**

## PRE-DEVELOPMENT TOTALS

**TOTAL AREA (ACRES) = 4.55**

**TOTAL RUNOFF (CFS) = 16.69**

HONEY HILL RANCH ROAD TENTATIVE MAP

PROJECT INFORMATION

ASSESSOR'S PARCEL NUMBERS: 404-032-73  
TAX RATE AREA: 51012  
REGIONAL PLAN DESIGNATION: CT, COUNTRY TOWN  
COMMUNITY PLAN AREA: ALPINE  
GENERAL PLAN DESIGNATION: NO. 3, RESIDENTIAL  
EXISTING ZONING: (SEE BOX)  
PROPOSED ZONING: (SEE BOX - NO CHANGE)  
WATER: PADRE DAM MUNICIPAL WATER DISTRICT  
SEWER: ALPINE SANITATION DISTRICT  
FIRE DISTRICT: ALPINE FIRE PROTECTION DISTRICT  
SCHOOL DISTRICT: ALPINE UNION SCHOOL DISTRICT (K-8), GROSSMONT UNION HIGH SCHOOL DISTRICT (9-12)  
STREET LIGHTING: COUNTY OF SAN DIEGO  
ACCESS: SUNCREST VISTA LANE, COUNTY MAINTAINED ROAD  
SITE ADDRESS: 3087 HONEY HILL RANCH ROAD, ALPINE, CA.  
ASSOCIATED PERMITS: NONE  
GRADING: CUT 8,250 C.Y.  
FILL 8,250 C.Y.  
EXPORT 0 C.Y.  
TOPOGRAPHY: PROVIDED SAN-LO AERIAL SURVEYS, DATED 12-21-04.  
SOLAR STATEMENT: ALL LOTS WITHIN THIS SUBDIVISION HAVE A MINIMUM OF 100 SQUARE FEET OF SOLAR ACCESS FOR EACH FUTURE DWELLING/COMMERCIAL/INDUSTRIAL/UNIT ALLOWED BY THIS SUBDIVISION.

ZONING DATA	USE REGULATIONS	NEIGHBORHOOD RESS.	EXIST. R/R2	PROP. R/R2
DENSITY	2	2	2	2
LOT SIZE	0.5 AC	0.5 AC	0.5 AC	0.5 AC
SUBDIVISION TYPE	C	C	C	C
MAX. FLOOR AREA	10,000	10,000	10,000	10,000
FLOOR AREA RATIO	20	20	20	20
HEIGHT	10	10	10	10
MIN. LOT COVERAGE	10	10	10	10
MIN. LOT SETBACK	10	10	10	10
MIN. FRONT SETBACK	10	10	10	10
MIN. SIDE SETBACK	10	10	10	10
MIN. REAR SETBACK	10	10	10	10
SPECIAL AREA RESS.				

EASEMENT DATA

- ④ AN EASEMENT FOR PUBLIC UTILITIES AND INCIDENTAL PURPOSES TO SAN DIEGO GAS AND ELECTRIC COMPANY, RECORDED NOVEMBER 20, 1928 AS BOOK 1561, PAGE 5 OF DEEDS.  
⑤ AN EASEMENT FOR PUBLIC UTILITIES AND INCIDENTAL PURPOSES TO SAN DIEGO GAS AND ELECTRIC COMPANY, RECORDED APRIL 24, 1951 IN BOOK 4071, PAGE 63 OF OFFICIAL RECORDS.

GENERAL NOTES

- ALL AREAS NOTED ARE GROSS AND NET, UNLESS OTHERWISE NOTED.
- THE DEVELOPER SHALL COMPLY WITH THE REQUIREMENTS SPECIFIED IN THE COUNTY STANDARDS FOR THE LOCATION OF STREET LIGHTS.
- THE DEVELOPER SHALL PAY PARK FEES IN LIEU OF PARK LAND DEDICATION.
- NO SPECIAL ASSESSMENTS WILL BE MADE OR REQUESTED.
- PROJECT DATA: 4.20 ACRES GROSS, 3.88 ACRES NET.
- MINIMUM LOT SIZE = 0.500 ACRES.
- TOTAL LOTS / DU'S = 7.

UTILITY NOTES

- WATER SYSTEM TO BE INSTALLED PER PADRE DAM MUNICIPAL WATER DISTRICT STANDARDS.
- SEWER SYSTEM TO BE INSTALLED PER ALPINE SANITATION DISTRICT STANDARDS.
- PROPOSED DRY UTILITIES SHALL BE PLACED UNDERGROUND ACCORDING TO COUNTY STANDARDS.

OWNER / SUBDMIDER / APPLICANT

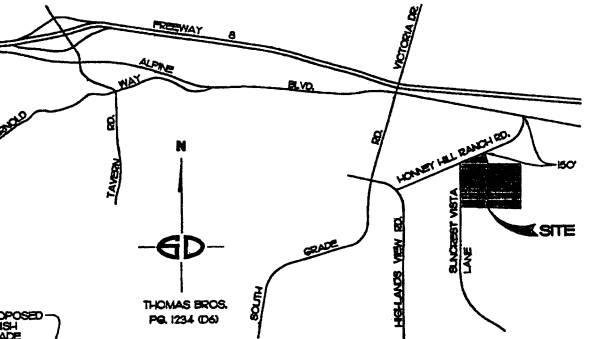
MICHAEL J. TOBY  
JOYCE TOBY  
3087 HONEY HILL RANCH ROAD  
ALPINE, CA 91901  
PHONE: 619/659-0184

MICHAEL J. TOBY JOYCE TOBY

LEGAL DESCRIPTION

A PORTION OF THE SOUTHEAST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 26, TOWNSHIP 15 SOUTH, RANGE 2 EAST, SAN BERNARDINO MERIDIAN, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO THE OFFICIAL PLAT THEREOF.

BASIN.	(AC.) AREA	LENGTH	Q <sub>100</sub>
A	2.30	480'	8.71
B	0.61	90'	2.50
C	1.55	210'	9.42
	4.55		16.69 cfs



VICINITY MAP  
NO SCALE

ENGINEER OF WORK

ENGINEER OF WORK  
**Snipes-Dye Associates**  
civil engineers and land surveyors  
6340 CENTER DRIVE, STE. G, LA MESA, CA 91942  
TELEPHONE (619) 697-9234 FAX (619) 460-2033



SHEET	DATE	BY	CHKD	REVISION
1				

# POST-DEVELOPMENT

\*\*\*\*\*

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT  
2003,1985,1981 HYDROLOGY MANUAL  
(c) Copyright 1982-2004 Advanced Engineering Software (aes)  
Ver. 2.0 Release Date: 01/01/2004 License ID 1305

Analysis prepared by:

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Fax (619)460-2033 Phone (619)697-9234

\*\*\*\*\* DESCRIPTION OF STUDY \*\*\*\*\*

\* HONEY HILL RANCH ROAD/TOBY TENTATIVE MAP \*

\* **POST-DEVELOPMENT RUNOFF CALCULATIONS** \*

\*\*\*\*\*

FILE NAME: AL1171PO.DAT  
TIME/DATE OF STUDY: 15:20 05/13/2005

-----  
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:  
-----

2003 SAN DIEGO MANUAL CRITERIA

**USER SPECIFIED STORM EVENT (YEAR) = 100.00**

6-HOUR DURATION PRECIPITATION (INCHES) = 3.500  
SPECIFIED MINIMUM PIPE SIZE(INCH) = 4.00  
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95  
SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD  
NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS

\*USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL\*

NO.	HALF- WIDTH	CROWN TO CROSSFALL	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT	GUTTER-GEOMETRIES: WIDTH LIP HIKE	MANNING FACTOR
	(FT)	(FT)		(FT)	(FT) (FT) (FT)	(n)
1	16.0	10.0	0.020/0.020/0.020	0.50	1.50 0.0313 0.125	0.0150
2	12.0	7.0	0.020/0.020/0.020	0.50	1.50 0.0100 0.010	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.50 FEET  
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
  2. (Depth)\*(Velocity) Constraint = 5.0 (FT\*FT/S)
- \*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN  
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.\*



## BASIN A - WESTERLY BASIN

\*\*\*\*\*

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

-----  
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

=====

RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600

SOIL CLASSIFICATION IS "D"

S.C.S. CURVE NUMBER (AMC II) = 84

INITIAL SUBAREA FLOW-LENGTH(FEET) = 161.00

UPSTREAM ELEVATION(FEET) = 2110.00

DOWNSTREAM ELEVATION(FEET) = 2087.90

ELEVATION DIFFERENCE(FEET) = 22.10

SUBAREA OVERLAND TIME OF FLOW(MIN.) = 5.348

WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN

THE MAXIMUM OVERLAND FLOW LENGTH = 100.00

(Reference: Table 3-1B of Hydrology Manual)

THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 8.830

SUBAREA RUNOFF(CFS) = 1.06

TOTAL AREA(ACRES) = 0.26      **TOTAL RUNOFF(CFS) = 1.06**

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*****
FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE = 62
-----
>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>(STREET TABLE SECTION # 2 USED)<<<<<
=====
UPSTREAM ELEVATION(FEET) = 2087.90  DOWNSTREAM ELEVATION(FEET) = 2067.20
STREET LENGTH(FEET) = 285.00  CURB HEIGHT(INCHES) = 6.0
STREET HALFWIDTH(FEET) = 12.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 7.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 2.42
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.14
HALFSTREET FLOOD WIDTH(FEET) = 7.27
AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.57
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.62
STREET FLOW TRAVEL TIME(MIN.) = 1.04  Tc(MIN.) = 6.39
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.875
RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) = 84
AREA-AVERAGE RUNOFF COEFFICIENT = 0.460
SUBAREA AREA(ACRES) = 0.75  SUBAREA RUNOFF(CFS) = 2.72
TOTAL AREA(ACRES) = 1.01  PEAK FLOW RATE(CFS) = 3.66

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.16  HALFSTREET FLOOD WIDTH(FEET) = 8.47
FLOW VELOCITY(FEET/SEC.) = 5.10  DEPTH*VELOCITY(FT*FT/SEC.) = 0.81
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 446.00 FEET.

*****
FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE = 1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 6.39
RAINFALL INTENSITY(INCH/HR) = 7.88
TOTAL STREAM AREA(ACRES) = 1.01
PEAK FLOW RATE(CFS) AT CONFLUENCE = 3.66

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\*\*\*\*\*  
FLOW PROCESS FROM NODE            4.00 TO NODE            5.00 IS CODE = 21  
-----

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

=====

RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT =	.4600
SOIL CLASSIFICATION IS "D"	
S.C.S. CURVE NUMBER (AMC II) =	84
INITIAL SUBAREA FLOW-LENGTH(FEET) =	55.00
UPSTREAM ELEVATION(FEET) =	2093.50
DOWNSTREAM ELEVATION(FEET) =	2087.90
ELEVATION DIFFERENCE(FEET) =	5.60
SUBAREA OVERLAND TIME OF FLOW(MIN.) =	3.966
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN T <sub>c</sub> CALCULATION!	
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =	9.222
NOTE: RAINFALL INTENSITY IS BASED ON T <sub>c</sub> = 5-MINUTE.	
SUBAREA RUNOFF(CFS) =	0.11
TOTAL AREA(ACRES) =	0.03
<b>TOTAL RUNOFF(CFS) =</b>	<b>0.11</b>

\*\*\*\*\*  
FLOW PROCESS FROM NODE            5.00 TO NODE            3.00 IS CODE = 62  
-----

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<  
>>>>(STREET TABLE SECTION # 2 USED)<<<<<  
=====

UPSTREAM ELEVATION(FEET) = 2087.90    DOWNSTREAM ELEVATION(FEET) = 2067.20  
STREET LENGTH(FEET) = 285.00    CURB HEIGHT(INCHES) = 6.0  
STREET HALFWIDTH(FEET) = 12.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 7.00  
INSIDE STREET CROSSFALL(DECIMAL) = 0.020  
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1  
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020  
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150  
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

\*\*TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 0.44  
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:  
STREET FLOW DEPTH(FEET) = 0.07  
HALFSTREET FLOOD WIDTH(FEET) = 3.82  
AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.03  
PRODUCT OF DEPTH&VELOCITY(FT\*FT/SEC.) = 0.20  
STREET FLOW TRAVEL TIME(MIN.) = 1.57    Tc(MIN.) = 5.53  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 8.639  
RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600  
SOIL CLASSIFICATION IS "D"  
S.C.S. CURVE NUMBER (AMC II) = 84  
AREA-AVERAGE RUNOFF COEFFICIENT = 0.460  
SUBAREA AREA(ACRES) = 0.17    SUBAREA RUNOFF(CFS) = 0.68  
TOTAL AREA(ACRES) = 0.20    **PEAK FLOW RATE(CFS) = 0.77**

END OF SUBAREA STREET FLOW HYDRAULICS:  
DEPTH(FEET) = 0.09    HALFSTREET FLOOD WIDTH(FEET) = 4.75  
FLOW VELOCITY(FEET/SEC.) = 3.43    DEPTH\*VELOCITY(FT\*FT/SEC.) = 0.29  
LONGEST FLOWPATH FROM NODE    4.00 TO NODE    3.00 = 340.00 FEET.

\*\*\*\*\*  
FLOW PROCESS FROM NODE            3.00 TO NODE            3.00 IS CODE =    1  
-----

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<  
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<  
=====

TOTAL NUMBER OF STREAMS =    2  
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM    2 ARE:  
TIME OF CONCENTRATION(MIN.) =    5.53  
RAINFALL INTENSITY(INCH/HR) =    8.64  
TOTAL STREAM AREA(ACRES) =    0.20  
PEAK FLOW RATE(CFS) AT CONFLUENCE =            0.77

\*\* CONFLUENCE DATA \*\*

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	3.66	6.39	7.875	1.01
2	0.77	5.53	8.639	0.20

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO  
CONFLUENCE FORMULA USED FOR    2 STREAMS.

\*\* PEAK FLOW RATE TABLE \*\*

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	3.94	5.53	8.639
2	4.37	6.39	7.875

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

**PEAK FLOW RATE(CFS) =            4.37**    Tc(MIN.) =    6.39  
TOTAL AREA(ACRES) =    1.21  
LONGEST FLOWPATH FROM NODE    1.00 TO NODE    3.00 =    446.00 FEET.

```

*****
FLOW PROCESS FROM NODE      3.00 TO NODE      6.00 IS CODE = 62
-----
>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>(STREET TABLE SECTION # 1 USED)<<<<<
=====
UPSTREAM ELEVATION(FEET) = 2067.20  DOWNSTREAM ELEVATION(FEET) = 2057.00
STREET LENGTH(FEET) = 205.00  CURB HEIGHT(INCHES) = 6.0
STREET HALFWIDTH(FEET) = 16.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 4.67
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.31
HALFSTREET FLOOD WIDTH(FEET) = 9.24
AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.80
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.49
STREET FLOW TRAVEL TIME(MIN.) = 0.71  Tc(MIN.) = 7.10
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.357
RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) = 84
AREA-AVERAGE RUNOFF COEFFICIENT = 0.460
SUBAREA AREA(ACRES) = 0.18  SUBAREA RUNOFF(CFS) = 0.61
TOTAL AREA(ACRES) = 1.38  PEAK FLOW RATE(CFS) = 4.69

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.31  HALFSTREET FLOOD WIDTH(FEET) = 9.24
FLOW VELOCITY(FEET/SEC.) = 4.82  DEPTH*VELOCITY(FT*FT/SEC.) = 1.50
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 6.00 = 651.00 FEET.

*****
FLOW PROCESS FROM NODE      6.00 TO NODE      6.00 IS CODE = 1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 7.10
RAINFALL INTENSITY(INCH/HR) = 7.36
TOTAL STREAM AREA(ACRES) = 1.38
PEAK FLOW RATE(CFS) AT CONFLUENCE = 4.69

```

\*\*\*\*\*

FLOW PROCESS FROM NODE 7.00 TO NODE 8.00 IS CODE = 21

-----  
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<  
=====

RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600

SOIL CLASSIFICATION IS "D"

S.C.S. CURVE NUMBER (AMC II) = 84

INITIAL SUBAREA FLOW-LENGTH(FEET) = 285.00

UPSTREAM ELEVATION(FEET) = 2091.50

DOWNSTREAM ELEVATION(FEET) = 2062.00

ELEVATION DIFFERENCE(FEET) = 29.50

SUBAREA OVERLAND TIME OF FLOW(MIN.) = 5.348

WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN

THE MAXIMUM OVERLAND FLOW LENGTH = 100.00

(Reference: Table 3-1B of Hydrology Manual)

THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN  $T_c$  CALCULATION!

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 8.830

SUBAREA RUNOFF(CFS) = 1.67

TOTAL AREA(ACRES) = 0.41      **TOTAL RUNOFF(CFS) = 1.67**

\*\*\*\*\*  
FLOW PROCESS FROM NODE 8.00 TO NODE 6.00 IS CODE = 61  
-----

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<  
>>>>(STANDARD CURB SECTION USED)<<<<  
=====

UPSTREAM ELEVATION(FEET) = 2062.00 DOWNSTREAM ELEVATION(FEET) = 2057.00  
STREET LENGTH(FEET) = 205.00 CURB HEIGHT(INCHES) = 6.0  
STREET HALFWIDTH(FEET) = 20.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 15.00  
INSIDE STREET CROSSFALL(DECIMAL) = 0.020  
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1  
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020  
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150  
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

\*\*TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 3.52  
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:  
STREET FLOW DEPTH(FEET) = 0.32  
HALFSTREET FLOOD WIDTH(FEET) = 9.54  
AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.43  
PRODUCT OF DEPTH&VELOCITY(FT\*FT/SEC.) = 1.09  
STREET FLOW TRAVEL TIME(MIN.) = 1.00 Tc(MIN.) = 6.34  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.908  
RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600  
SOIL CLASSIFICATION IS "D"  
S.C.S. CURVE NUMBER (AMC II) = 84  
AREA-AVERAGE RUNOFF COEFFICIENT = 0.460  
SUBAREA AREA(ACRES) = 1.02 SUBAREA RUNOFF(CFS) = 3.71  
TOTAL AREA(ACRES) = 1.43 **PEAK FLOW RATE(CFS) = 5.20**

END OF SUBAREA STREET FLOW HYDRAULICS:  
DEPTH(FEET) = 0.35 HALFSTREET FLOOD WIDTH(FEET) = 11.30  
FLOW VELOCITY(FEET/SEC.) = 3.73 DEPTH\*VELOCITY(FT\*FT/SEC.) = 1.31  
LONGEST FLOWPATH FROM NODE 7.00 TO NODE 6.00 = 490.00 FEET.



\*\*\*\*\*

FLOW PROCESS FROM NODE 6.00 TO NODE 6.00 IS CODE = 1

-----  
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<

>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<

=====

TOTAL NUMBER OF STREAMS = 2

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MIN.) = 6.34

RAINFALL INTENSITY(INCH/HR) = 7.91

TOTAL STREAM AREA(ACRES) = 1.43

PEAK FLOW RATE(CFS) AT CONFLUENCE = 5.20

\*\* CONFLUENCE DATA \*\*

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	4.69	7.10	7.357	1.38
2	5.20	6.34	7.908	1.43

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO  
CONFLUENCE FORMULA USED FOR 2 STREAMS.

\*\* PEAK FLOW RATE TABLE \*\*

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	9.56	6.34	7.908
2	9.53	7.10	7.357

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

**PEAK FLOW RATE(CFS) = 9.56 Tc(MIN.) = 6.34**

**TOTAL AREA(ACRES) = 2.82**

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 6.00 = 651.00 FEET.

## BASIN B - NORTHERLY BASIN

\*\*\*\*\*

FLOW PROCESS FROM NODE 10.00 TO NODE 11.00 IS CODE = 21

-----  
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<  
=====

RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600

SOIL CLASSIFICATION IS "D"

S.C.S. CURVE NUMBER (AMC II) = 84

INITIAL SUBAREA FLOW-LENGTH(FEET) = 110.00

UPSTREAM ELEVATION(FEET) = 2091.50

DOWNSTREAM ELEVATION(FEET) = 2075.00

ELEVATION DIFFERENCE(FEET) = 16.50

SUBAREA OVERLAND TIME OF FLOW(MIN.) = 5.348

WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN

THE MAXIMUM OVERLAND FLOW LENGTH = 100.00

(Reference: Table 3-1B of Hydrology Manual)

THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN  $T_c$  CALCULATION!

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 8.830

SUBAREA RUNOFF(CFS) = 2.19

TOTAL AREA(ACRES) = 0.54      **TOTAL RUNOFF(CFS) = 2.19**

## BASIN C - SOUTHERLY BASIN

\*\*\*\*\*

FLOW PROCESS FROM NODE 20.00 TO NODE 21.00 IS CODE = 21

-----  
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<  
=====

RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600  
SOIL CLASSIFICATION IS "D"  
S.C.S. CURVE NUMBER (AMC II) = 84  
INITIAL SUBAREA FLOW-LENGTH(FEET) = 245.00  
UPSTREAM ELEVATION(FEET) = 2086.00  
DOWNSTREAM ELEVATION(FEET) = 2084.00  
ELEVATION DIFFERENCE(FEET) = 2.00  
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 9.757  
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN  
THE MAXIMUM OVERLAND FLOW LENGTH = 62.65  
(Reference: Table 3-1B of Hydrology Manual)  
THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.992  
SUBAREA RUNOFF(CFS) = 1.41  
TOTAL AREA(ACRES) = 0.51 **TOTAL RUNOFF(CFS) = 1.41**

\*\*\*\*\*

FLOW PROCESS FROM NODE 22.00 TO NODE 23.00 IS CODE = 21

-----  
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<  
=====

RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600  
SOIL CLASSIFICATION IS "D"  
S.C.S. CURVE NUMBER (AMC II) = 84  
INITIAL SUBAREA FLOW-LENGTH(FEET) = 270.00  
UPSTREAM ELEVATION(FEET) = 2092.00  
DOWNSTREAM ELEVATION(FEET) = 2090.00  
ELEVATION DIFFERENCE(FEET) = 2.00  
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 9.832  
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN  
THE MAXIMUM OVERLAND FLOW LENGTH = 59.63  
(Reference: Table 3-1B of Hydrology Manual)  
THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.962  
SUBAREA RUNOFF(CFS) = 1.92  
TOTAL AREA(ACRES) = 0.70 **TOTAL RUNOFF(CFS) = 1.92**

## POST-DEVELOPMENT TOTALS

**TOTAL AREA (ACRES) = 4.57**  
**TOTAL RUNOFF (CFS) = 15.08**

